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works of a permanent nature were ever attempted beyond serais ; the ruins of several very fine ones are to be seen on the route. "The present dilapidation of these buildings is sometimes adduced as a proof of our indifference to the comforts of the people ; it is not considered that where they do exist in good repair they are but little used, and that the present system of government no longer renders it necessary that travellers should seek protection in fortified enclosures. If they are to be considered proofs of the solicitude of former monarchs for their subjects' welfare, they are also standing memorials of the weakness and insufficiency of their administration ; add to which that many of the extant serais were the offspring not of imperial but of private liberality."

The British Government has frequently been taunted with the little they have done for the comforts of the people, as compared with their Mohammedan predecessors ; and although it is not attempted to deny the great beauty of many of *their* structures, it may be doubted whether the work of the Great Ganges Canal, which fertilizes a whole province, is not likely to prove of more substantial benefit to the people, than all the boasted works of their Mogul masters, during their 600 years' dominion ; while the scientific survey of India is as magnificent a monument of civilization as any country in the world can boast of.

III.—*Notes on the Valley of Kashmir.* By Capt. H. H. AUSTEN, F.R.G.S., 1st Battalion, 24th Regiment, Topographical Assistant, Government Trigonometrical Survey, Panjab.

Read, December 12th, 1859.

THE few following observations must be considered merely supplementary to the very interesting and able report by Colonel Waugh, giving a detailed account of the manner in which the Kashmir Trigonometrical Survey is conducted, the area which it comprises, and the high altitudes over which those connected with it have to carry the Trigonometrical net-work. Having been employed on the survey of several districts of that valley, perhaps a few remarks, however meagre, may prove interesting to those present who have never visited that part of the W. Himalaya range. Many general observers, looking at a map like the one now exhibited, however much taken with the drawing and execution of it, the last phase of its existence, as it may be called, may perhaps think little of the immense work—that of weeks, months, and years which it has taken ; the altitudes climbed, the long, wearing descents (for, of the two, the last is the most tiring and difficult

when it is continued for any length of time and the slopes great); the days and nights spent in taking observations from the many hundreds of trigonometrical stations; the pages of computation that this afterwards entails in working out the sides of the triangles; the drawing and working up of each plane-table section, and the large number of men who share in the work, from the officers in charge to the native signallers.

To this may be added the minor inconveniences of sleeping out of doors on the frosty summits of these lofty ridges, or running short of supplies. All these may serve to give some idea of the amount of labour entailed in the survey of a country such as this.

In April, 1857, I received orders from the Indian Government to proceed and join the Kashmir surveying party then at Srinagar, in charge of Captain Montgomerie (Engineers), and about to begin its field operations for that year.

The portion of country I was first directed to map lies in the north-western part of the plan now exhibited, and comprised the area drained by the Kahmil river, one of the principal feeders of the Jhelum or the Vedusta, which receives the whole drainage of the valley. This river takes its rise in several branches from the north side of the Kajnag range, which has a mean altitude of from 12,000 to 13,000 feet above the sea. Its other sources lie in the western watershed of Kashmir—in the range separating that valley from that of the Kishengunga river: this latter flows through a tract of country which until lately was entirely unknown, and has not yet been surveyed; it takes its rise near the famous peak of Nunga-Purbet (or the naked mountain), which, rising in icy grandeur to an altitude of 26,000 feet, presents from the Kajnag and adjacent ridges one of the most magnificent and imposing views to be seen amidst this stupendous scenery of the Himalaya.

The plain of Shaloorah is about 5300 feet above the sea. The Kahmil river, as it crosses the plain of Shaloorah, is very rapid, and during the meeting of the snows is quite impassable.

This plain is well cultivated in its lower levels, the principal crop being rice, which is planted out in June and harvested at the end of September. The whole plain is studded with innumerable small villages and substantially-built log huts with peat roofs, which give at a distance quite an English appearance to the country: these are surrounded with walnut trees of large growth, from the fruit of which oil is extracted, and with orchards of apple and pear trees. The white-heart cherries, here called Gläs, are nowhere so fine as in the Utter Pergunnah of Kashmir. The other common trees are the poplar, plane, and elm. Many thousands of acres were formerly under cultivation in this district even on the upper terraces of the alluvial deposit, but the old irri-

gation canals having long since broken away, and the people being at present too poor to repair them, these lands are fast becoming as dense a jungle as those which have never been turned by a plough. Of the same appearance is the beautiful little valley of Lolāb, which gives a feeder to the Kahmil river, with its densely-wooded slopes running down from the Trigonometrical Station of Manganwar, &c.

This country is not ours, and it is perhaps unfortunate for it as well as for us that it was handed over to the Maha Rajah Goolab Singh. Much has been said of late respecting the colonisation of the East. The whole of this district is admirably suited for European occupation, and no part of India assimilates more to a European climate. Had we kept the country, and had British colonies been formed in these hills (a very easy matter), they would have been the means of establishing with greater firmness our supremacy over the north-west of India and in the Punjab. At present there are no roads, there not being such a thing as a wheeled conveyance of any sort in the valley of Kashmir, all produce being carried on men's backs even to the Punjab. Were Anglo-Saxon experience, talent, and labour brought to bear on these lands, they would amply repay the settler, as almost anything might be grown here, and the present crops might be much increased by improved cultivation.

The low alluvial hills between the plain and the main range are covered with dense forests of deodar and other conifers; these, with a few rough roads cut through them, would furnish an almost inexhaustible supply of building material. Here, in the parts lately cleared, Indian corn is the crop generally grown by the natives, who, being goojurs, or shepherds, sow their ground, and then leave for the hills with their cattle; a few return when the crop is nearly ripe, to protect it from the bears, who are particularly destructive to it: these, descending at night from the hills, make great ravages in the corn-fields; at this time the men who keep watch are obliged to remain out all night, seated on high covered seats, shouting at intervals.

Proceeding from the plains towards the Kajnag range, we continue through forests of deodar until close under the steep ascent, when the *Pinus picea* forests begin, tall, gloomy, and dense, with open spaces here and there covered with a dense growth of *Impatiens rosea*.

Here the shepherds make their first halting-place before the snow should have quite cleared away upon the hills. Higher up, the belt of pine and horse chestnut begins to thin out, and is interspersed with birch and large patches of *Rhododendron campanulatum*, which, when in full bloom, are splendid objects.

About the end of April the shepherds ascend the grassy slopes

and glades about the summits of the ridges, where the pasturage is of the richest description. Higher still thousands of sheep are taken, which are kept solely for their wool, from which the Kashmirians make their strong and warm blankets and other woollens.

The plain of Shulurah, some of the physical and geological features of which have been described in a communication made to the Geological Society, is much higher than that of the main valley, and the lake which once covered it must have been separated from the lake which filled the great valley by the ridge running away from the peak of Manganwar and Margabsunger. The lacustrine deposits in the Shulurah valley are of great thickness and at two distinct levels. Further up the Kahlmil river, near its confluence with the Rūngwāri from the north-eastward, is a large mass of débris at a height of 200 feet above the present level of the river, consisting of large, worn, and angular rocks, brought down from above, and deposited there most probably by glacier action.

The axis of the Kajnag range is of granite, with schistose and slaty rocks on the spurs running away from it; towards its western end it becomes exceedingly precipitous and rocky, so that it is very nearly impossible to proceed for any distance upon the ridge itself, and frequent détours of two and three miles have to be made when passing from peak to peak. The most western peak of all, being a slaty rock, was very difficult and dangerous of ascent, on account of the loose stones which keep constantly falling; the weight of the foot often causing whole yards of surface to give way at a time.

The cold on these ridges at the early time of the year when I was on them was very great, making it at times quite impossible to work at the plane-table, or even to set it up, from the high wind which constantly blows from the northward. It was, however, a choice of difficulties, for with the west wind which blows up the Jhelum valley comes all the moisture from the plains of the Punjab, enveloping all the higher ground in a dense wetting mist. From these three causes I had to spend the greater part of May and June, having been kept ten days at a time encamped on the same peak, the only wood which is here attainable being the short twigs of the juniper. On this range the Markore, or wild goat, abounds, and I fancy in no part are more numerous; they are very large, often reaching eleven hands in height, with peculiarly handsome, graceful horns; this animal, so far as we know, has a somewhat limited range, being confined to the Pir Pinjal, Kajang, and Khagan hills, and in those across the Indus in the Swat country. Of other animals of the Kajnag range, the kustura, or musk-deer, is also common; bears were numerous. The beautiful menäl and other pheasants abundant, and, with red-legged

and snow partridge, afford a welcome addition to the general sameness of mountain fare.

The southern slopes of the Kajnag range are of quite a different character to the northern; now, with the exception of the eastern sides of the spurs, which alone are covered with forests, the whole is quite bare or covered only with coarse grass. Somewhat lower this is mainly of the kind called spear-grass, which, working its way into the clothes, makes walking a torture, as the barbed heads can only be taken out on the inside of the cloth.

On all level spots where the plough can be used excellent wheat is grown, and is considered to be the best on this side of the Jhelum valley.

The villages of this part of the Kashmir valley are mostly situated in the bottoms of the ravines which run down to the River Jhelum, where the rice cultivation commences on the flat alluvial deposits, the fields being all laid out in terraces for the purpose. These alluvial grounds are found at the junctions of all the many rivers with the Jhelum. The mass is composed of the rocks of the main range, mixed up with enormous weather-boulders of granite from the highest peaks.

These alluvial masses must have been formed under water, and the materials carried down by some action (perhaps glacial) from above. The Jhelum river everywhere flows through a deep channel on the extreme end or ridge of the alluvial deposit.



Of this nature are the cultivated spots at Gingle, Uri, and Kūttai; from this I infer that formerly the Jhelum river presented a number of small lakes along its course, connected with each other, and, the river gradually wearing away the barriers between them, these lakes in course of time became drained.

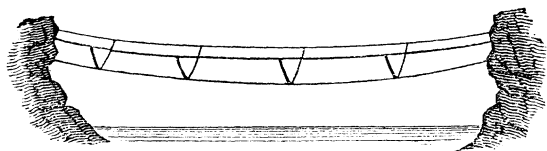
Along the banks of the Jhelum river the forests of deodar commence again, but all the fine timber has nearly disappeared here it can with ease be thrown into the stream, and no steps are taken for preserving the forests. Further from the banks the forests of deodars are dense, and mixed with elm, yew, maple, hazel, ash, and other trees. The Jhelum, from Gingle to Uri, is a perfect torrent, especially near the village of Gingle, where the fall is very great. The rocks in many places appear as if they had been rent asunder or cut through.

The people of this district are very different in appearance to the Kashmirians, and are more nearly allied to the natives of the

Punjab; the Kashmiri dialect ceases to be spoken, and Hindoos are more numerous. There are some very interesting ruins on the right bank, of the same style as those of Martund, Avantipura, &c., built of large hewn blocks of granite. They stand under some high basaltic cliffs, which rise perpendicularly from the river at a distance in many places of only 200 to 300 yards. The scenery here is of the most sublime character, the deodars growing out of every nook and angle in the cliffs, which rise to an elevation of 7000 to 9000 feet, or 3000 to 5000 above the river. At Urie is one of the old *Serais*, or halting-places, built in the time of the Delhi emperors, Jehaugir, &c., this being the route often taken by them in their visits to the valley. Other *serais* occur at Mozuf-ferabad, and are to be traced to the Hazarah country as far as Hassan Abdal, at the place called Wah, and also at Kala-serai, on the present Lahore and Peshawur road.

The temperature of this valley (Jhelum) is much higher than that of the valley of Kashmir during the summer months, from the hills running up at so steep an angle on both sides. Under canvas the heat is oppressive, but the nights are always cool.

The river is crossed in several places by suspension rope-bridges, called *jhuler* and *zâmpûr* by the Kashmirians. They are made of both hide and twig ropes. The bridge is composed of three ropes; the feet rest on one, while the two upper are for the hands; they are kept apart by the forked branches of trees, thus—



At first they are not easy to cross by those unaccustomed to them, swinging about as they do, and, with the river rushing and tumbling about beneath, it requires a good head to make the transit in safety, the footway being often a *single* rope. The natives carry heavy loads over them with the greatest ease. Those bridges which are made of the twig-ropes are the best, but they require to be often renewed.

Up the lateral streams are some rich and fertile valleys, with small scattered villages in them. The chief wealth of the inhabitants are their buffaloes. The pasturage in the adjoining hills being very rich, they make large quantities of butter and ghee, which is made by the melting down of the butter. This ghee they send to the plains in great quantities.

As regards the north-eastern side of the valley of Kashmir, and the Wurdwun valleys, or the country below the eastern

water-parting, it may be stated generally that it has much of the same character as the western end. The spurs from the bounding range run out further into the main valley, and the country consequently presents a series of lofty narrow valleys, running up to the northern Pūnjāls. These spurs are all densely wooded and full of the Barāk-singha, or red deer of Kashmere.

On the summits of these hills are fine pastures, where large numbers of ponies are bred yearly.

The marmot, which occurs nowhere in the west of the valley, is here found in myriads, its shrill whistle being heard all over the barren rocks on every side.

There are several pretty little lakes at this end of the valley, at an elevation of 12,500 feet.

The country on the other or eastern side of the main range is called Wurdwān, and has in every respect a very different character to any part around it.

Being surrounded by mountains which attain a great elevation, it has a very cold climate; the woods are sparse, the trees stunted, and in the upper parts disappearing altogether, the birch being the last to be met with.

The hills are extremely precipitous and rocky. On every side the ravages caused by avalanches descending from the higher regions meet the eye in the form of overthrown trees and transported rocks.

Further up the Wurdwān river, which is tributary to the Chenab, the country in many parts is sealed to man.

It presents nothing but bare rock, and to follow up the different lateral streams is a matter of the greatest difficulty; in many cases it is impossible.

Steep precipices run straight down into the bottom of the valleys, and no animal save the ibex can pass along them. These valleys lead up to the glaciers of the main Himalayan range.

One road leading to the country of Sūrū, or Sūr Būtan, passes over the glacier of Bhūt Khol, which is about six miles in length, with an average breadth of from three-quarters to half a mile, stretching out, however, in some places to a mile and a-half. It is much fissured in some parts of its course, and the scenery on either side is of the grandest character. This glacier is at an elevation of about 13,500 *feet*, while the mountains rise on either side to 18,000 to 20,000 feet, with slopes often of 5000 and 6000 feet.

A band of eucrinital limestone occurs in Wurdwān, and which also contains a brachiopod shell, which has been referred by Mr. Davidson to the genus *Productus*. Higher the rocks are of black micaceous schist, which, from its crumbling nature, gives a black appearance to the foot of the great Bhūt Khol glacier.

In the inhabited portion of the Wurdwān valleys the villages

are small and wretched. Wheat will not ripen in these regions, and the only crops are of a seed called Tromba.

These people are snowed up for so long a time in winter that their flocks of sheep are small in number, it being difficult for them to feed any large number.

The wild animals are the Ibex, Stag, and Bear. The first of these is found in the wildest and most inaccessible parts of this region, and it is a most beautiful sight to see a herd of these animals going up the steep face of a hill, displacing the loose rocks as they go, which come tumbling about beneath them in every direction.

The remains of large moraines, now many miles from the termination of the existing glaciers, and also at the ends of lateral valleys, which at present have no glaciers at all, serve, I think, to show that the climate of this part of the world must formerly have been much colder than it is now.

The inhabitants of Wurdwān are in every respect identical with those of Kashmir.

IV.—*Notes in Persia, Khorassan, and Afghanistan.* By Captain CLAUDE CLERK, F.R.G.S.

1. *Route from Tehrān to Herāt, viâ Meshed and Toorbut-Sheik-Iam.*

THIS road, skirting the Salt Desert of Khorassan, lies immediately at the base of the lower ranges of the Elburz mountains. Here and there the road is crossed by spurs of these mountains. The road, after leaving Meshed, bears south and crosses the Afghan frontier somewhere near Koosan, but this frontier is by no means clearly defined; the wandering tribes of Huzurehs and Timooorees, some of whom have settled in the villages about the frontier, bearing allegiance sometimes to Persia and sometimes to Herat.

*Tehrān to Kabūt Gūmbaz, 6½ H. R., 22½ M.**

August 19th, 1857.—Left the city by the Shahabdoolazheem, or southern gate. Immediately on leaving the city, on the right, is an extensive burial-ground—road across open plain, in parts cultivated, and broken by embankments and cannauts: † the latter are seen in great numbers in the plain all round the

* H. R., Hours' ride. The time occupied in riding the distance, at a walk. M., Miles.

† These appear to the eye as a series of mounds of earth at a distance of about 50 yards apart. By means of a subterranean passage—the excavated earth being thrown up, forming these cannauts, resembling the burrowing of a mole—water is brought sometimes 5 and 6 miles across the plain. In this way but little evaporation takes place, and a stream thus conducted supplies a village for years, which would otherwise be dry in a few days.